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IS : 9272 (Part II) - 1979

Indian Standard

SPECIFICATION FOR DISK RECORD PLAYING EQUIPMENT

PART II AMPLIFIERS AND LOUDSPEAKERS

UDC 681·844·086·7

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

September 1980

AMENDMENT NO. 1 NOVEMBER 1984

TO

IS:9272(Part 2)-1979 SPECIFICATION FOR DISK RECORD PLAYING EQUIPMENT

PART 2 AMPLIFIERS AND LOUDSPEAKERS

Alteration

(*Page 3, clause 1.1*) - Substitute the following for the existing clause:

'1.1 This standard (Part 2) covers the characteristics of amplifiers and loudspeakers of disk record playing equipment. It does not apply for professional use.'

(*LTDC 23*)

Reprography Unit, ISI, New Delhi, India

Indian Standard

SPECIFICATION FOR DISK RECORD PLAYING EQUIPMENT

PART II AMPLIFIERS AND LOUDSPEAKERS

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(*Continued on page* 2)

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Indian Standard

SPECIFICATION FOR DISK RECORD PLAYING EQUIPMENT

PART II AMPLIFIERS AND LOUDSPEAKERS

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 31 December 1979, after the draft finalized by the Recording Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 This standard (Part II) specifies the characteristics of amplifiers and loudspeakers of disk record playing equipment. Part I of this standard specifies the characteristics of record players of disk record playing equipment.

0.3 While preparing this standard, assistance has been derived from IEC Publication 98-1964 'Processed disk records and reproducing equipment', issued by the International Electrotechnical Commission.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2 - 1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) covers the characteristics of amplifiers and loudspeakers of disk record playing equipment.

2. TERMINOLOGY

2.0 For the purpose of this standard, the terms and definitions covered in IS : 1885 (Part XLVIII/Sec 2) - 1979†, shall apply in addition to the following.

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*Rules for rounding off numerical values (*revised*).

†Electrotechnical vocabulary : Part XLVIII Recording, Section 2 Disk recording.

2.1 Reproducing (or Replay) Characteristic — The curve of output voltage *versus* frequency that would be obtained when moving the reproducing stylus with constant velocity at various frequencies

NOTE — Reproducing characteristics are normally plotted with frequency as abscissa on a logarithmic scale and with voltage as ordinate on a logarithmic scale (*see* IS : 8159 - 1976*).

3. DESIGN AND CONSTRUCTION

3.1 General — The amplifier shall be solid state unit operating from ac and/or battery. It shall be complete with all accessories and control for operation. It shall be capable of use in horizontal position and shall be designed to use under tropical conditions.

3.2 Housing — Housing shall be an integral part of the amplifier. The housing shall be strong enough to stand the normal shocks and stresses.

3.3 Carrying Means — A suitable carrying means shall be provided for portable amplifier. Facilities for carrying accessories shall be provided. Where a separate carrying case is provided, it shall also have facilities for storing the normal accessories

4. INDICATORS, CONTROLS AND OTHER COMPONENT PARTS

4.1 Power Switch — A power switch shall be provided which shall disconnect the power supply line when in 'OFF' position. This may form part of the amplifier gain control.

4.2 Reproduce Volume Control — Easily accessible controls shall be provided to adjust the amplifier gain during reproduction.

4.3 Loudspeakers — Loudspeaker of permanent magnet type shall be provided as an integral part (either as built-in or external) of the unit. *In the case of stereophonic replay equipment, two matched loudspeakers,* one for each channel, shall be provided and the effective frequency response shall be stated by the manufacturer. In case loudspeaker(s) is (are) not supplied with the amplifier the manufacturer shall indicate relevant characteristics for matching with suitable loudspeaker Sockets for headphones, earphones and external loudspeakers may also be provided.

5. CONDITIONS OF MEASUREMENT

5.1 Provisions of 4 of IS : 9302 (Part II) - 1979† shall apply.

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*Scales and sizes for plotting frequency characteristics and polar diagrams

†Characteristics and methods of measurements for sound system equipment : Part II Amplifiers.

6. POWER SUPPLY

6.1 Supply —The amplifier shall be capable of operating either from ac mains or battery or both.

6.1.1 *Battery Operation* — The amplifier shall operate from suitable batteries as specified by the manufacturers The number and type of cells shall be indicated. The battery shall be housed in a suitable compartment. The battery compartment should permit easy insertion/removal of cells and firm/positive electrical connection. The corrosive and other deleterious effects of accidental leakage from the cells shall be confined to the battery compartment. The current drain of the batteries during normal operation shall be specified.

6.1.2 *Mains Operation* — The amplifier shall operate from 240 V $^{+10}_{-15}$ percent, 50 Hz ac power source.

7. SAFETY

7.1 The equipment shall conform to the relevant requirements specified in IS : 616 - 1957* so far as mains operation is concerned.

8. REPRODUCING EQUIPMENT FOR STEREOPHONIC FINE GROOVE RECORDS

8.1 Channel Orientation — Stereophonic reproducing equipment shall have two channels and shall be so connected that the right-hand loudspeaker(s), as viewed from the audience, shall be actuated by the groove wall which is further away from the centre of the record.

8.2 Channel Phasing — Stereophonic reproducing equipment shall be so connected that movement of the reproducing stylus tip parallel to the record surface (as with a monophonic record) produces in-phase sound pressures at the right- and the left-hand loudspeaker(s).

8.3 Channel Gain — The gains of the two channels of stereophonic reproducing equipment shall be so adjusted that movement of the reproducing stylus tip parallel to the record surface (as with a monophononic record) produces equal sound pressures at the right- and left-hand loudspeaker(s).

9. MARKING

9.1 The equipment shall be clearly and indelibly marked with the following:

a) Manufacturer's name or trade-mark;

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*Code of safety requirements for mains-operated radio receivers.

b) Model No. and serial number;

c) Supply voltage [type of supply/supplies, voltage(s), frequency];

d) Maximum power consumption; and

e) Country of manufacture.

9.1.1 The equipment may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the rules and regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

10. OPERATING AND MAINTENANCE INSTRUCTIONS MANUAL

10.1 This manual shall contain relevant operating maintenance and any other special instructions required for long operating life of the equipment. Service manual containing a list of parts, spares and accessories and circuit diagrams shall be supplied on request.

11. TEST DATA

11.1 Each equipment shall be tested by the manufacturer and the test results shall be supplied with the equipment.

12. TEST SCHEDULE

12.1 This test schedule specifies all the tests, their methods of measurement as well as the requirements to be met with for amplifiers.

12.2 The test schedule shall be as given in Table 1.

TABLE 1 TEST SCHEDULE

(*Clause* 12.2)

Sl. No.	Characteristic	Method of Measurement	Requirement
(1)	(2)	(3)	(4)
1.	Rated source impedance	—	It shall match the impedance of phonograph pick-up cartridge
2.	Rated source emf	8.7 of IS : 9302 (Part II)-1979*	As specified by the manufacturers
3.	Minimum source emf for rated output	—	do
4.	Rated load impedance	—	As specified by the manufacturer
5.	Rated output power	8.10 of IS : 9302 (Part II) - 1979*	To be specified by the manufacturer The amplifiers shall be able to deliver the rated output power at rated distortion during a period of at least 10 minutes with all channels operating simultaneously at rated output power and at ambient temperature between 15 and 35°C Note — Multi-channel amplifiers shall be rated with all channels operating simultaneously at rated output power
6.	Overload source emf	8.13 of IS : 9302 (Part II) - 1979*	*Non-equalized inputs* : 2 V *Equalized inputs* . 30m V at 1 000 Hz
7.	Effective frequency range	8.2 of IS : 9302 (Part II)-1979*	The frequency range shall be one of the following categories of frequencies : 150 Hz to 6·3 kHz 63 Hz to 12·5 kHz 40 Hz to 16 kHz

---

**Characteristics and methods of measurements for sound system equipment:* Part II Amplifiers.

(*Continued*)

TABLE 1 TEST SCHEDULE — *Contd*

SL No.	CHARACTERISTIC	METHOD OF MEASUREMENT	REQUIREMENT
(1)	(2)	(3)	(4)
			Permissible deviations from the required frequency response, referred to the response at 1 kHz. Non-equalized inputs ± 2·0 dB. Equalized inputs ± 3 0 dB
8.	Total harmonic distortion	8.23.1 of IS : 9302 (Part II) - 1979*	Total harmonic distortion at rated output power shall be 5 percent for frequency of 500 Hz and above and 10 percent for frequency less than 500 Hz
9.	Rated signal-to-noise ratio:		
	a) Wide band (*see* Note 1)	8.27.1 of IS : 9302 (Part II) - 1979*	Shall be ⩾ 40 dB related to output level at full modulation with rated nominal input voltage (volume control up to −20 dB position) and tone controls (if any) set for flat frequency response
	b) Weighted (*see* Note 1)	8.27.2 of IS : 9302 (Part II) - 1979* (*See* Notes 2, 3 and 4)	Shall be ⩾ 50 dB

NOTE 1 — The noise level is expressed with reference to the rated output power since loudspeakers designed for use with higher power amplifiers are normally of lower sensitivity than those designed for use with lower power amplifiers

NOTE 2 — When during the measurements an input has to be terminated with the rated source impedance, this shall be:

22 kΩ/250 pF for non-equalized high voltage/impedance-inputs.

2 2kΩ for equalized low voltage inputs (magnetic pick-up inputs and the like).

NOTE 3 — When during the measurements the rated source emf has to be applied, the following values of source emf shall be used instead of any other value stated by the manufacturer·

500 mV for non-equalized high voltage/impedance inputs.

5mV (1 000 Hz) for equalized low voltage inputs (magnetic pick-up inputs and the like).

NOTE 4 — All controls to be set to such a position that requirements according to Sl. No. 7 are met.

*Characteristics and methods of measurements for sound system equipment : Part II Amplifiers.

(*Continued*)

TABLE 1 TEST SCHEDULE — *Contd*

SL No.	CHARACTERISTIC	METHOD OF MEASUREMENT	REQUIREMENT
(1)	(2)	(3)	(4)
10	Overall cross-talk attenuation	12.3	⩾30 dB at 1 kHz
11	*Gain alignment*	8.44 of IS : 9302 (Part II)-1979*	*Within a frequency range* of 200 Hz - 6 300 Hz the gain difference between channels shall not be more *than* 4 dB. To stereo-sets this applies *to* gain *control settings* from maximum to —46 dB
12	Equalizer reproducing characteristic	12.4	Inaccordance with Fig. 1 and 2

*Characteristics and methods of *measurements for sound system equipment:* Part II Amplifiers.

12.3 Overall Cross-Talk Attenuation

12.3.1 *Between Channels* — The following procedure shall be followed:

a) The amplifiers, mounted in the specified position, are brought under rated conditions;

b) The output voltage U_2 of one of the amplifiers is measured;

c) The source emf of this amplifier is reduced to zero, the other amplifier under consideration remaining under rated conditions;

d) The output voltage U'_2 of the first amplifier is measured;

e) The 'overall' cross-talk attenuation, expressed in decibels is:

$$20 \log_{10} \frac{U_2}{U'_2}$$

f) The measurement is repeated for a number of frequencies, adequately covering the frequency range of the amplifier;

g) The result is given either in a table or as a graph presenting the 'overall' — cross-talk attenuation as the ordinate and the frequencies as the abscissa, the measuring points being indicated; and

h) This procedure is repeated for the other amplifier.

NOTE — If the cross-talk components do not significantly exceed the noise in the frequency band of measurement, then a selective measurement of the cross-talk components shall be made, the contributions of the different components under consideration being summed according to the 'square law'. The contribution of a cross-talk component, not significantly exceeding the noise in a third-octave band, shall be neglected.

12.3.2 *Between Inputs* — The measurement is made according to **12.3.1**, taking into account the following amendments:

a) The amplifier is brought under rated conditions for each of the input channels separately, the corresponding position of the volume controls being marked;

b) The cross-talk from channel *a* to channel *b* is measured with rated source emf connected to the input of channel *a*, the volume control reduced to zero, the source emf of channel *b* reduced to zero and the volume control set at the pre-marked position; and

c) The volume controls of the remaining input channels are reduced to zero.

12.4 Reproducing Characteristics

12.4.1 *Statement of Reproducing Characteristics*

12.4.1.1 With constant velocity of the reproducing stylus tip, the curve of voltage output of the reproducing chain *versus* frequency shall be that which results from the combination of the following four curves:

- — one falling with rise of frequency in conformity with the impedance of a parallel combination of a capacitance and a resistance having a time constant of t_1;
- — one falling with rise of frequency in conformity with the impedance of a series combination of a capacitance and a resistance having a time constant of t_2;
- — one rising with frequency in conformity with the admittance of a series combination of a capacitance and a resistance having a time constant of t_3, and
- — one rising with frequency in conformity with the admittance of a series combination of a capacitance and a resistance having a time constant of t_4.

The combined curve is defined by:

$$N\,(\text{dB}) = 10 \log \left(1 + \frac{1}{4\pi^2 f^2 t_2^2} \right) - 10 \log \left(1 + 4\pi^2 f^2 t_1^2 \right) - 10 \log \left(1 + \frac{1}{4\pi^2 f^2 t_3^2} \right) - 10 \log \left(1 + \frac{1}{4\pi^2 f^2 t_4^2} \right)$$

Where f is the frequency in hertz and t_1, t_2, t_3 and t_4 are as follows:

t	*Coarse Groove* second	*Fine Groove* second
t_1	50×10^{-6}	75×10^{-6}
t_2	450×10^{-6}	318×10^{-6}
t_3	$3\,180 \times 10^{-6}$	$3\,180 \times 10^{-6}$
t_4	$7\,950 \times 10^{-6}$	$7\,950 \times 10^{-6}$

These curves are shown in Fig. 1 and 2, and the approximate relative values are shown in Table 2.

NOTE — Coarse groove records manufactured, in some countries require the fine groove reproducing characteristic.

12.4.2 *Reproducing Characteristic Tolerances*

12.4.2.1 No tolerances are specified since commercial record reproducers usually contain a 'tone control' enabling the frequency characteristic to be varied over a wide range. However, it should be possible, within the range, to obtain a close approximation to the characteristics specified in **12.4.1**.

12.4.2.2 At frequencies below 20 Hz, the reproducing characteristic [specified in **12.4.1** and shown dotted (......)in Fig. 1 and 2] represents the maximum response of the reproducing system.

TABLE 2 RECORDING CHARACTERISTICS

(*Clause* 12.4.1.1)

RECORDING — RELATIVE LEVEL		FREQUENCY	REPRODUCING — RELATIVE LEVEL	
Coarse groove (1) dB	Fine groove (2) dB	(3) Hz	Coarse groove (4) dB	Fine groove (5) dB
—	—	2	− 3·2	− 0·2
—	—	2·5	− 1·3	+ 1·8
—	—	3·15	+ 0·7	+ 3·7
—	—	4	+ 2·7	+ 5·7
—	—	5	+ 4·5	+ 7·6
—	—	6·3	+ 6·4	+ 9·4
—	—	8	+ 8·2	+ 11·2
—	—	10	+ 9·7	+ 12·8
—	—	12·5	+ 11·1	+ 14·1
—	—	16	+ 12·4	+ 15·4
− 16·3	− 19·3	20	+ 13·3	+ 16·3
− 16·0	− 19·0	25	+ 13·8	+ 16·8
− 15·5	− 18·5	31·5	+ 14·9	+ 17·0
− 14·8	− 17·8	40	+ 13·8	+ 16·8
− 14·0	− 16·9	50	+ 13·3	+ 16·3
− 12·9	− 15·9	63	+ 12·5	+ 15·4
− 11·6	− 14·5	80	+ 11·3	+ 14·2
− 10·2	− 13·1	100	+ 10·1	+ 12·9
− 8·8	− 11·6	125	+ 8·7	+ 11·5
− 7·2	− 9·8	160	+ 7·1	+ 9·7
− 5·8	− 8·2	200	+ 5·7	+ 8·2
− 4·5	− 6·7	250	+ 4·5	+ 6·7
− 3·3	− 5·2	315	+ 3·3	+ 5·2
− 2·3	− 3·8	400	+ 2·3	+ 3·8
− 1·5	− 2·7	500	+ 1·5	+ 2·6
− 0·9	− 1·6	630	+ 0·9	+ 1·6
− 0·4	− 0·8	800	+ 0·4	+ 0·8
0	0	1 000	0	0
+ 0·4	+ 0·7	1 250	+ 0·4	− 0·8
+ 0·9	+ 1·6	1 600	− 0·9	− 1·6
+ 1·4	+ 2·6	2 000	− 1·4	− 2·6
+ 2·1	+ 3·7	2 500	− 2·1	− 3·7
+ 3·0	+ 5·0	3 150	− 3·0	− 5·0
+ 4·2	+ 6·6	4 000	− 4·2	− 6·6
+ 5·5	+ 8·2	5 000	− 5·5	− 8·2
+ 7·0	+ 10·0	6 300	− 7·0	− 10·0
+ 8·7	+ 11·9	8 000	− 8·7	− 11·9
+ 10·5	+ 13·7	10 000	− 10·5	− 13·7
+ 12·2	+ 15·6	12 500	− 12·2	− 15·6
+ 14·3	+ 17·7	16 000	− 14·3	− 17·7
+ 16·2	+ 19·6	20 000	− 16·2	− 19·6

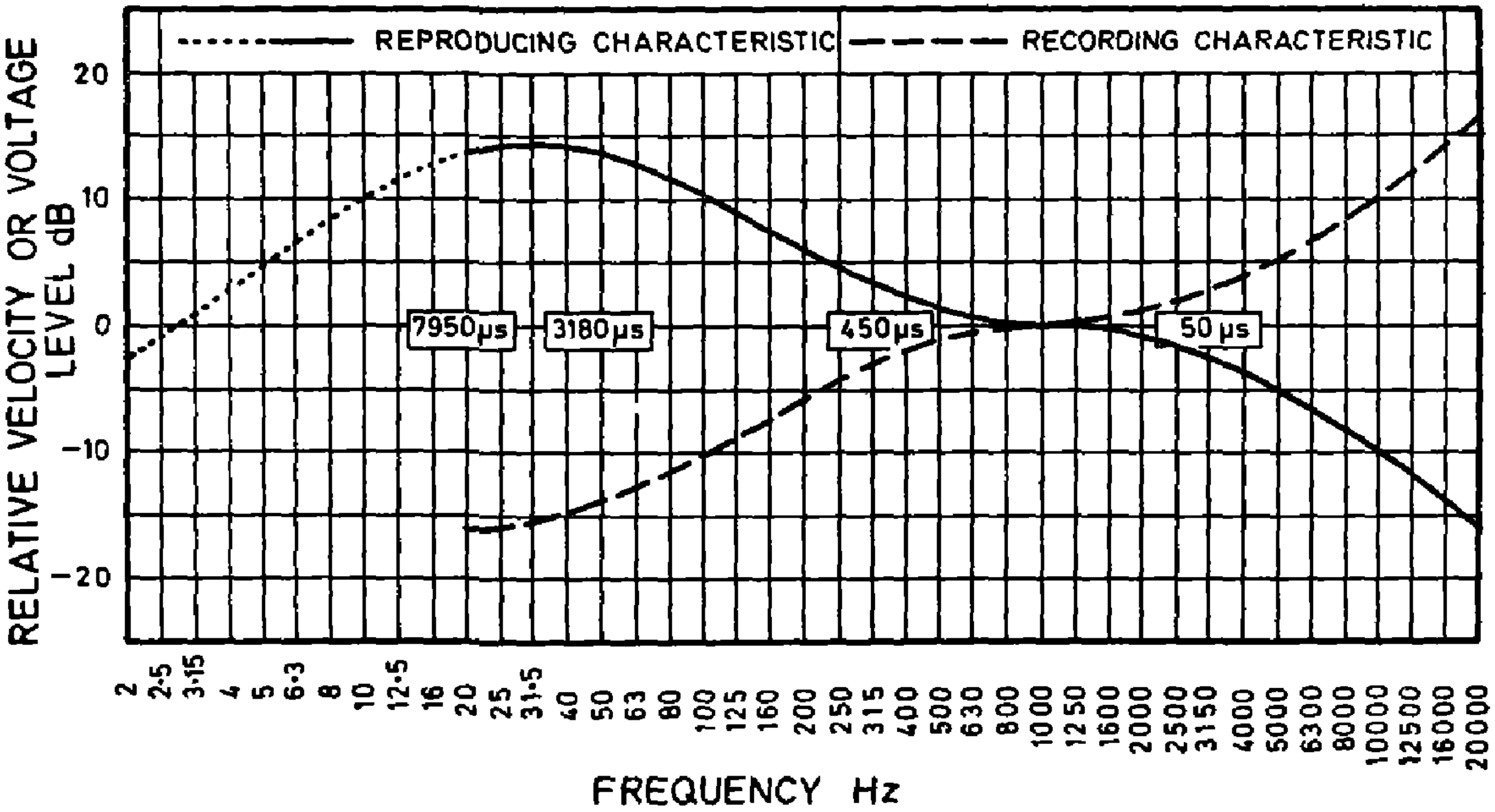

Fig 1 Characteristics for Coarse Groove Disk Records

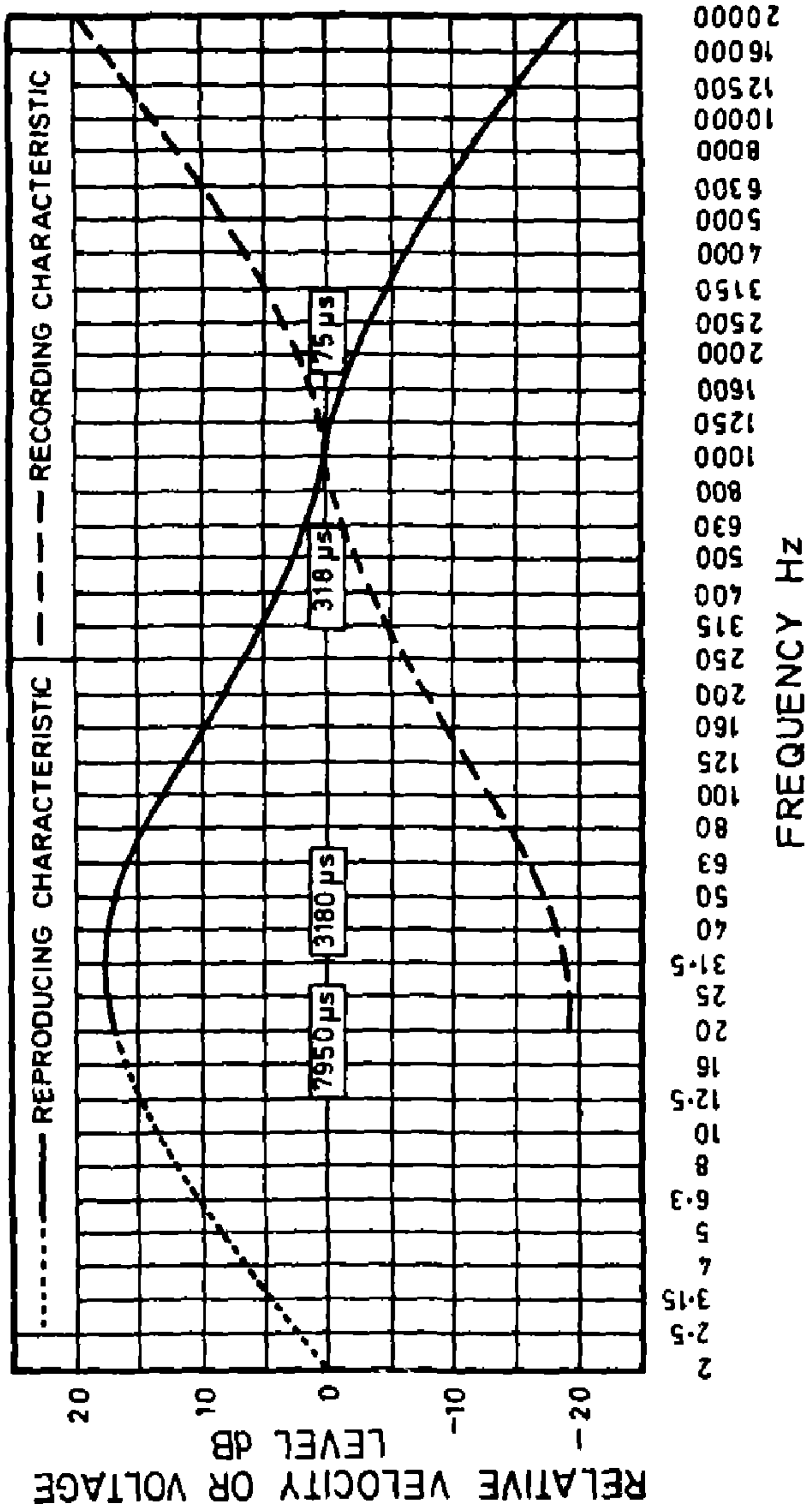

FIG. 2 CHARACTERISTICS FOR FINE GROOVE DISK RECORDS

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg. m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

INDIAN STANDARDS INSTITUTION

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 26 60 21, 27 01 31 **Telegrams : Manaksanstha**

Regional Offices:			Telephone
Western	Novelty Chambers, Grant Road	BOMBAY 400007	37 97 29
Eastern	5 Chowringhee Approach	CALCUTTA 700072	27 50 90
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Patliputra Industrial Estate	PATNA 800013	6 28 08
Hantex Bldg (2nd Floor), Rly Station Road	TRIVANDRUM 695001	32 27

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